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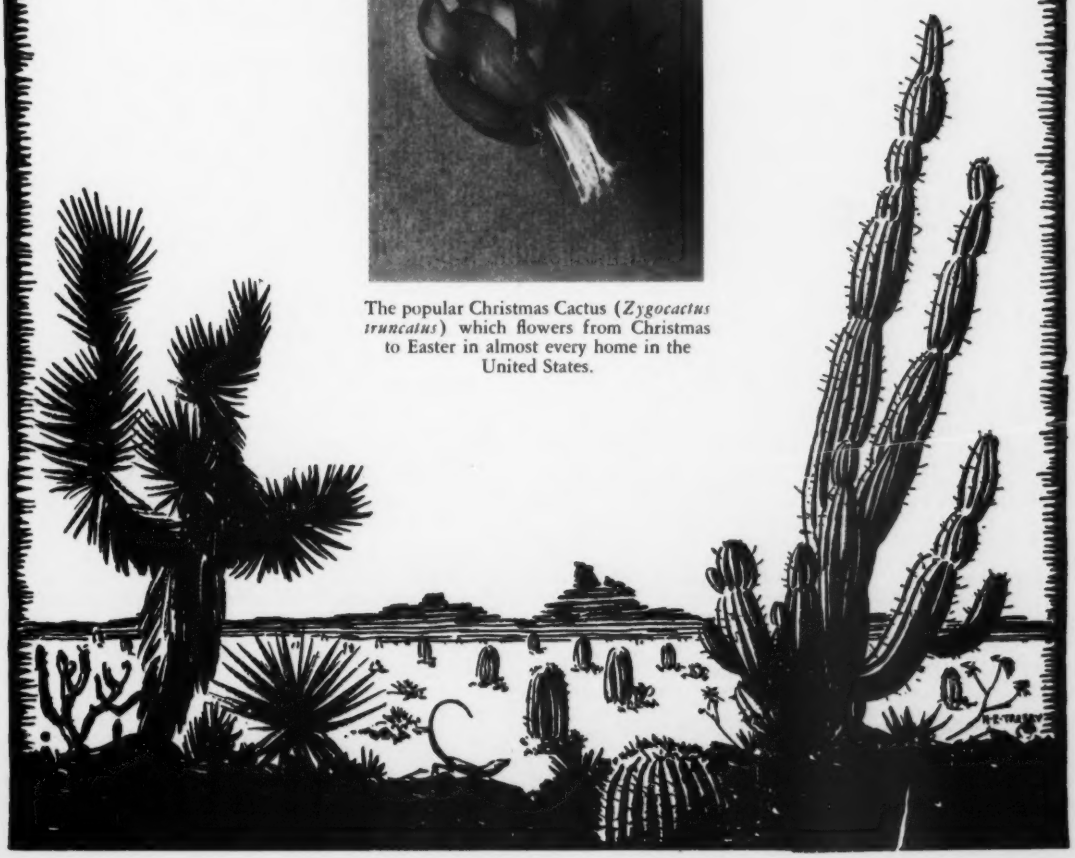
CACTUS AND SUCCULENT JOURNAL

Of the Cactus And Succulent Society Of America

Vol. XII DECEMBER, 1940 No. 12

The popular Christmas Cactus (*Zygocactus truncatus*) which flowers from Christmas to Easter in almost every home in the United States.



CACTUS AND SUCCULENT JOURNAL

Published and Owned by the Cactus and Succulent Society of America, Inc., Box 101, Pasadena, California. A monthly magazine to promote the Society and devoted to Cacti and Succulents for the dissemination of knowledge and the recording of hitherto unpublished data in order that the culture and study of these particular plants may attain the popularity which is justly theirs. Subscription $3.00 per year. Foreign $3.00 per year by international money order. Membership in the Cactus Society free with subscription. Mail application to SCOTT HASELTON, *Editor*, Box 101, Pasadena, Calif. *Editorial Staff*: THE ENTIRE SOCIETY. Entered as Second Class Matter at Pasadena, Calif., under act of March 3, 1879.

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IMPORTANT NOTICE—BINDING JOURNALS

This issue of the JOURNAL completes Volume XII. The index for this volume will be printed in the January issue. You need not wait for the index but you may send in your 12 issues of Vol. XII with $1.50 and we will include the index, bind the volume in cloth, and return it postpaid in February. For missing copies of the JOURNAL add 25c each.

You may also bind at the same time, your six issues which comprise Volume XI (July 1939—Dec., 1939, inc.). Remove the index of Vol. XI from the Jan., 1940 JOURNAL. This volume can be bound for $1.50. Without extra charge we will include the *Ten-Year Cumulative Index* in the front of Vol. XI.

The Ten-year Index will also be available bound separately for $1.50. Libraries will receive a special letter regarding this index which will be available after Jan. 31.

Another binding notice will be printed in the January JOURNAL, after which no more copies can be bound this year. Bindings for foreign countries will be 15c extra per volume. Back volumes of the JOURNAL may be bound at this time for $1.50 each. Please send check or money-order with all orders, as we cannot send invoices for bindings.

Three or four more issues will complete "Colorado Cacti." You should remove these sections from your JOURNALS or we will bind them as received. Later you will have an opportunity to have this monograph bound separately. "Colorado Cacti" will complete the fourth book which has been made possible by installment printing. These books alone have a market value which more than exceeds what you have paid for the JOURNAL these 12 years. That means your JOURNAL is an investment not only for information but for books as well.

We have several colored plates ready for the JOURNAL. When the growing season starts, we will have a complete coverage on the subject of Vitamin B^1 and on the feeding of plants. We are prepared for a year of productivity, and your prompt renewals and continued loyalty will make 1941 one of the best years we have known.

SCOTT HASELTON, Box 101, Pasadena, Calif.

CLOSE OUT OF EPIPHYLLUMS

CUTS at 20c each

Hermosus, hermosissimus, Col. Kuehnrich, Stern von Erlau, Wuertemberg, Aurantiacus superbus, Hans Rehm, Hofrat Bouche, The Lord, Sarah Courant, Madam Sallier, Antwerpia, Aurora, Franz Lehar, de Longpre (yellow striped), Schlesien, Triumph des anthieux, Martha Knebel, Otto Schmidt, Frau Dr. Ziegler, Frau Foldi Cvetnic, Prima Donna, Flor del sol, Empereur, Ernst Seyderhelm, Dante, Guedenay, Padre, A. V. Fric, Admiral Togo (a wide and curved leaf crenatus, my own), Paula Knebel, Friedrich Werner Beul, Francisco, Frau Johanna Attenhofer, Madam de Laet, Ferdinand Schmoll, Prof. Schindler, Dr. von Meyenburg, Etoile de Contich, Crenatus Dr. Rose, Blutrot, Knebels No. 52, Knebels No. 71, Knebels No. 72 (satin white-hanging), Knebels No. 49, Knebels No. 27, Knebels No. 212, German Empress, Autumn, Conways giant, Ferdinand Haage, German No. 5, Koening Humbert, Cooperi, Roseus superbus, Frau Ilse Hess, Anton Guenther, Pfersdorffii, Crenatus splendens.

CUTS at 35c each

Couranti, Tula, Luna, Phyllantoides grandiflorus, Germania, Gertrude Knebel, Horst Wessel, Friend Wegener, Ernst Udet, Curt Backeberg, Max Richter, Euphrosine (one of my favorites), Viviana, Fango, Sachsenland, Livingston, Camillo, Schneider, Lewerenz, Large Fire Red (my own), Otto Siepke, Rother's Saemling, Rother's cooperi, Bismarck, Nony von Tilburg, Franz Schubert, Curt Dormsch, Ceka.

CUTS at 50c each

Walter Haage, Frau Stanka Stozier, Dr. Jos. Goebbels, Knebels No. 59, Anna Bruennow, Graf Zeppelin.

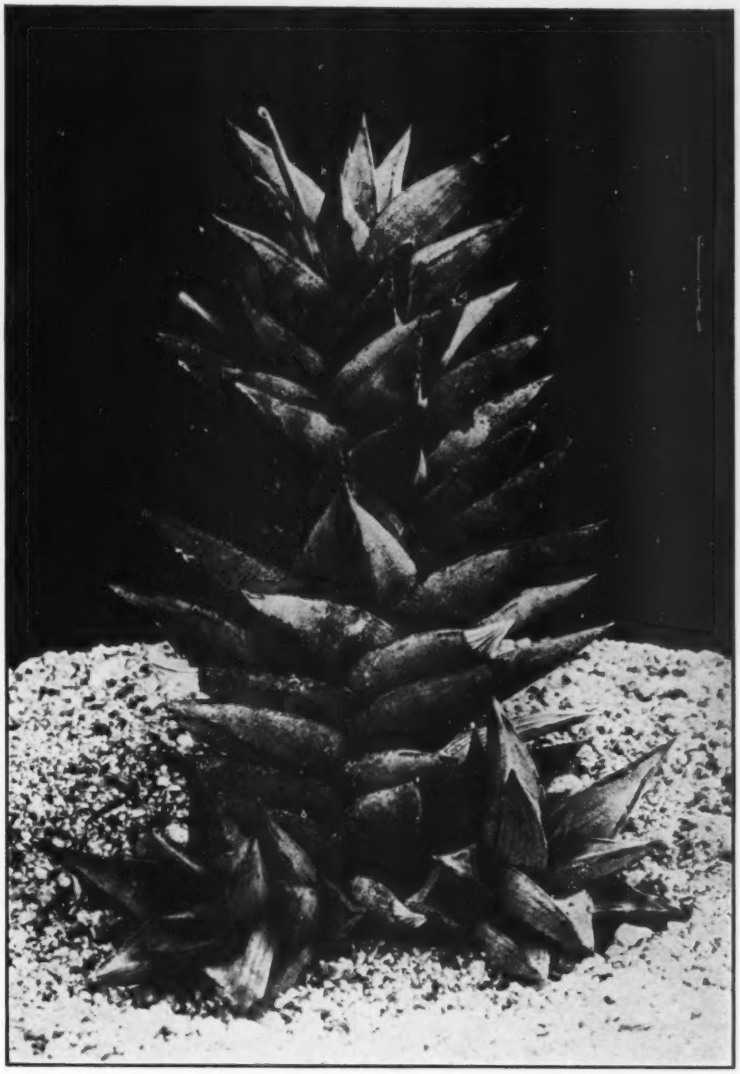
Many young plants of various kinds at 25c and 35c.

Due to the low prices, no order for less than $2.00. Please remit postage and if a generous postage allowance is made we will send larger cuts.

My collection is open to the public on Sundays only. If the cuts ordered are not available, I will not substitute unless permitted to do so.

H. M. WEGENER

Mail correspondence to Box 151, San Pedro, Calif.



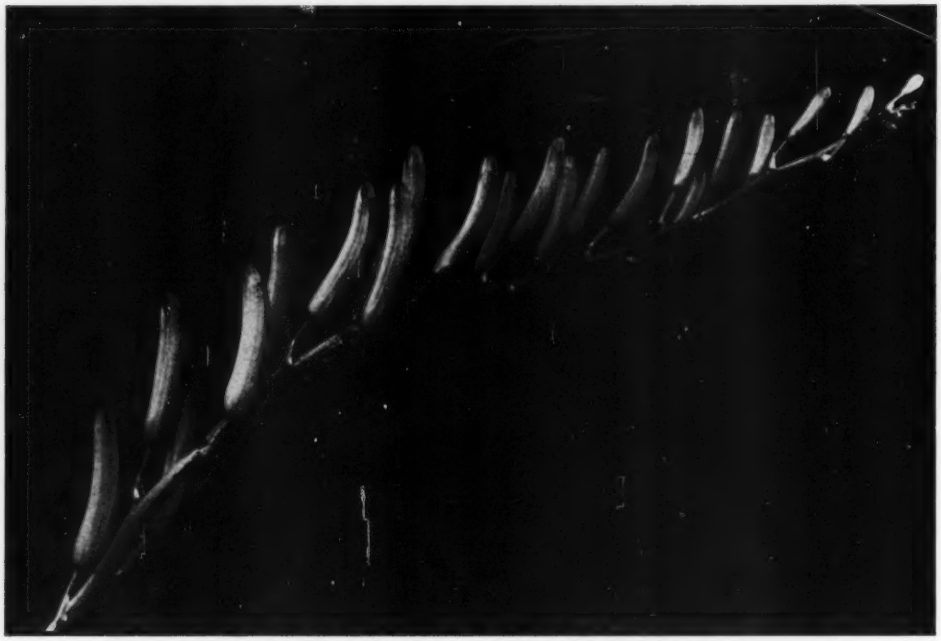
Apicra rubriflora L. Bol. nat. size.

Notes on Apicras

By J. R. BROWN

Apicra rubriflora, L. Bol. in Ann. Bol. Herb. III (1920-24) 13. Pl. II, D.

Plant with densely leaved, erect stems, 14 cm. and more tall, 6.5-9 cm. in diam., slowly proliferous from the base. Leaves in 5 spiral rows, spreading, obscurely lined, 2.5-4 cm. long, 20-24 mm. wide towards the base, ovate-triangular, acuminate and pungent, face of leaves concave,



Inflorescence of *Apicra rubriflora* L. Bol. nat. size.

back of leaves rounded and obliquely keeled, the thickened margins and the keel smooth or minutely crenulately roughened.

Peduncle, includ. the subsecund raceme, about 40 cm. tall, flowers erect; bracts lanceolate acuminate, to 6 mm. long, pedicels usually slightly longer; perianth bright red, 2-2.5 cm. long, 5-6 mm. in diam., tube cylindrical, the apex lightly constricted and decurved, the small segments connivent.

Locality: Bonnievale, Swellendam Div.

"A very distinct sp. characterized by the red perianth and the reduplicate-valvate outer perianth segments."

This Apicra was described from plants which flowered at Kirstenbosch, April, 1918.

This Apicra flowers in So. California during Sept. and Oct. and it is pleasantly surprising when the attractive red flowers are first seen.

Mrs. Bolus describes the plant as having 4 ranked leaves, but all the plants seen by the writer have the leaves in 5 rows. The bright green leaves have a very hard, whitish wax-like covering, giving the plants a glaucous appearance. As observed here, either when flowering under glass or out of doors, the peduncle is somewhat arching, the flowers all becoming erect by the twisting of the pedicels so that a somewhat secund inflorescence is presented. The photo of an inflorescence shows the flowers in the position they assume. It is also interesting to note the distinct manner in which, soon after anthesis, the upper part of the perianth tube twists tightly.

In a résumé of a talk given before the Cac. & Succ. Soc. of Gt. Britain and which appeared in the Cac. Journ. Mar., 1927, D. J. Wonfor spoke of *Apicra rubriflora* as seen on a hillside near Bonnievale in the following terms, "This Apicra is a marvelous sight in autumn when it is in flower for, at the same time, the hot summer sun has burned the leaves to the same colour as the flowers, turning the hillside to a blaze of scarlet."

The writer also has a plant of this Apicra which bears yellow flowers, the yellow color being a little deeper than the yellow of the flowers of *Aloe tenuior*.

MEALY BUG CONTROL

Use Tar Soap or Fels Naptha (common wash soap). Spray plant with lukewarm water; use old toothbrush or tooth pick with cotton on it. Apply plenty of soap and brush on infected parts. Let stand for about 30 minutes. Rinse plant with lukewarm water. If you have any soap suds, put some on bottom of plant. Cheap remedy, but very good. Watch plant. Repeat foregoing method if necessary.

ALBERT WAHRENBERG, Cincinnati, Ohio.

SPLITTERS BEWARE

One of the greatest pitfalls of the unguided student of biology is the naming of new species or altering the classification of a series without adequate material or information. The first offense is a very common, but no less excusable, one. Too many self-appointed enlighteners are unaware that the taxonomic system is intended to show *relationships* rather than *differences*. Thus we have come to use a binomial system which shows the relationship of a group of species under a given genus. Should a cactus be discovered which has every character identical to a species already described except, say, flower color, it would indeed be an error to give this plant a new specific name (even though the different flower color be constant for all plants in a given locality). Such an act would in no way indicate its relationship to the prior-named one, which is an important observation. Yet its different flower color is also important, so we use a trinomial, giving our plant the rank of sub-species, variety, form, or what you will.

Characters of significance in classification should be carefully considered before they are established. They must be constant characters that occur in nature. This eliminates characters resulting from selective breeding, hybridizing, etc. The results of such processes must be given "nursery" or "catalogue" names. They have their value, but not in scientific nomenclature.

The fact that characters to be significant must be constant in nature renders valueless any conclusions drawn unless unlimited material is at hand and can be subjected to all the conditions of the natural habitat (which is highly impractical, if not impossible), or better yet, unless the student can make his observations in the field where the plant is growing naturally. For lack of either of the last named necessities, the work of Mr. E. Shurly (Cact. and Succ. Jour. Sept. '40, p. 141) is, in my opinion, of little scientific importance. He suggests as a basis for his forthcoming classification the degree to which a cactaceous plant has become adapted to fulfill "its status as a cactus." If Mr. Shurly should work long in the field, I am sure he would be disappointed to see his proposed characters break down under an avalanche of paradoxes. Typically globose species frequently form long cylindrical plants under certain conditions in nature; individuals of one species may have three distinct kinds of roots; one by one, the characters prove themselves inconstant in nature. Add to this the great changes that many species undergo when brought into cultivation, and it becomes evident that study in the field is essential to any drastic revision of system. It is this lack of material that has given rise to most of the synonomy in scientific literature.

Granted that having access to long series is not always possible when describing a new species or form. A careful study of the literature is the next thing, and synonymy can usually be avoided thus.

However, before attempting my revolutionary changes in the system, consideration should be given to the fact that the early students have long since studied and discarded such obvious parts as roots in establishing taxonomic characters.

By no means is the entire content of this paper directed at Mr. Shurly, for several of the points I have taken have no relation to his article. Rather, I am entering a plea to potential "splitters" to consider carefully before the desire to see their work in print overwhelms them. The Nomenclature Committee is a step in the right direction.

Among the Butterfly "students" of this country and Europe, the describing of "new species" (forms, varieties, et al.) has become a bitter farce. They are even applying names (varietal) to individual *sports* that occur once and may never be duplicated!

May Cactology be spared such an ignominious end.

GRAHAM HEID.

"It's a neighborhood project; designed to meet the menace of parachute troops, you know"

EVEN CACTUS COLLECTORS CARRY ON AND CANNOT BE DEFEATED

Dear Mr. Haselton:

I thought you might be interested to hear from an English reader of your "Cacti for the Amateur." I borrowed it from the library of the Cactus and Succulent Society of Great Britain, just before the outbreak of war and it has given me great help in caring for my small collection. I have made several successful grafts entirely by following Mr. Frank Mark's excellent directions and diagrams, and whenever I need advice on any difficulties, your book never fails me. Besides all this, it is a charming little book and has given me great pleasure, especially during the days of tension in August and September last year.

I have taken your advice and specialized in my collection, choosing the hairy varieties. You would be amused to see my favorite cacti being carried from their little greenhouse into our "refugee-room" each time the raid-warning sounds, and out again directly afterwards, so that they get as much sun as possible.

With good wishes and many thanks for the enjoyment your book has given me,

Yours sincerely,

(MISS) AUDREY NORTON.

ONLY ONE BID MADE ON CACTUS

WASHINGTON, Nov. 20.—The Coast Guard today received only one bid for construction of a 180-foot combination cutter and lighthouse tender to be named the Cactus. The vessel, tentatively slated for service out of Seattle, was offered by the Sullivan Dry Dock & Railway Corp., Brooklyn, N. Y., for $849,000.

WANTED

I am very anxious to contact some member who can spare some small plants or cuttings of Stapelias, Huernias, Duvalias, Trichocaulons, Hoodias, Tavaresias, and Haworthias. JAY GILKEY, 1625 N. W. 29th St., Oklahoma City, Okla.

THE TROUBLESOME RED SPIDER

From Madison Cooper's GARDENING MAGAZINE

The red spider, Tetranychus telarius, one of the most common pests on house plants, is not a real spider, but a mite. It is almost too small to be visible to the naked eye but a lens of low power will reveal its actual character. Patches of brick-red or brownish color, with fine webs of white on the lower side of the leaves, especially if the latter tend to turn yellow, should always excite suspicion.

They will quickly suck the life out of a plant unless routed. They are quickly conquered with clear cold water, if persistently applied. They thrive in a hot dry room and detest moisture. So, spray, from top to bottom, or rather from bottom to top, giving the under side of the leaves a regular sousing. As they are protected by their own web, it may take some force to penetrate this shelter.

In hot dry weather, outdoor plants, as dahlias, roses, chrysanthemums, geraniums, violets, etc., may suffer from their attacks. The cure may be hastened by the use of Ivory soap, a small cake to five or six gallons of water, and applied with force. A dusting of sulphur will also discourage them.

When Red Spider occurs on your house plants, just suspect that this is a warning that your living room is too hot and dry for health. Spray, spray, and both you and the plants will be in better condition for the added moisture.

BESSIE L. PUTNAM, (Penna.)

CACTUS DESERTS OF THE SOUTHWEST

As told to W. TAYLOR MARSHALL *by* F. RADLEY

When the urge for cactus exploration becomes acute in Hermann Marks, something usually happens. In this case the result was a 6,200 mile trip through southwestern deserts with Fred Radley during which many valuable observations were made and a few plants added to the wonderful Marks' collection.

The start was made from El Paso where Mr. Marks joined Mr. Radley. Their trip included visits to the Big Bend country and eastward to the extreme southeast tip of Texas, returning through New Mexico and Southern Utah.

At one point a thunder storm produced so much precipitation as to necessitate the retracing of the route to avoid numerous washes ahead but in a few moments the washes already crossed were running so much water that the car had difficulty in crossing. These "dips" had been forded without difficulty before the rain. When the water reached above the running board while crossing the last wash, the excellence of their judgment in beating a hasty retreat was evident.

On this trip they found specimens of *Hamatocactus setispinus,* 18 inches in height and 8 inches in diameter (Fig. 4). Britton and Rose note a maximum height of of 15 cm. or 6 inches in their description of the plant. Note the numerous flower remains shown in this picture as well as buds just forming. Mr. Radley says that this is one of the most prolific bloomers of the sphaerical cacti, the brilliant yellow flowers appearing in succession for six months or more out of the year.

They also observed (Fig. 6) that cacti, especially Opuntias, inhabit lava flows and rocky districts unfavorable to other vegetation and stop abruptly at the edge of the richer, grass producing land. The interesting pet shown in this photo was found in this same lava flow.

In eastern Texas, near Rio Hondo, the thicket of *Acanthocereus pentagonus* shown in Fig. 5 was noted as one of the few remaining colonies of this species and complete extermination of the species in this district can be safely predicted. *Acanthocereus pentagonus* grows in the flat country and in rich soil. The constant inroads by agriculturists will soon eliminate it as it has almost entirely eliminated *Selenicereus spinulosus,* once also plentiful here.

Echinocereus pentalopus and *E. Blanckii* are usually found under the colonies of *Acanthocereus pentagonus* as are also *Ferocactus hamatocanthus, H. setispinus* and *Coryphantha Muehlenpfordtii,* but these also will soon yield to growers of winter vegetables.

In the Big Bend country of Texas an *Echinocereus* thought to be new was discovered. It is of the cylindrical, soft-fleshed type and bears small pink flowers near the top of the stems. The closely-set, black and red spines completely arm this plant. Collected specimens are now in bud and determination of its specific relationship can be settled when these buds open.

It is worthy of note that all this Big Bend country on both sides of the river will be consolidated into a national park as both the United States and Mexico are planning for this accomplishment. Some idea of the magnificence of the scenery can be had by photos Fig. 1 and 2, which represent the west and east.

The specimen of *Echinocereus triglochidiatus* var. *gonocanthus,* has been heretofore known only from the white sand hills of New Mexico, but the photograph was taken 70 miles north of the white sands and shows one plant of a large colony which grows in a flat, grazing country in soil not containing an appreciable amount of gypsum.

Search was made at the two points shown in photos. Fig. 7 shows the Vermillion cliffs in southern Utah and Fig. 8 the west approach to Zion Canyon. A few specimens of this very rare plant were secured.

1. Grand Canyon of the Rio Grande. 2. Southeast corner of the Big Bend country. 3. *Echinocereus triglochidatus*. 4. Large plant of *Hamatocactus setispinus*. 5. *Acanthocereus pentagonus* near Rio Hondo, Texas. 6. Opuntias and occasionally rattlers (picture somewhat exaggerated) inhabit the lava flows. 7. Vermillion cliffs in southern Utah. 8. West approach to Zion Canyon, Utah.

Mrs. Monmonier grows her plants outdoors under lath.

ILLUSTRATED EPIPHYLLUM LIST

Ventura Epiphyllum Gardens deserves the highest praise for its leadership in publishing the first illustrated catalog dealing exclusively with Epiphyllums. Because these plants can be grown in every part of the country, they will continue in their popularity. The beautiful flowers, rather than the plants, are the goal of every grower and with reasonable care one is rewarded a thousandfold. The rare coloring in the flowers is difficult to describe, but Mrs. Monmonier has accomplished this not only in her list of well known Epiphyllums but in the new seedlings that she has developed in her own garden. This catalog is a starting point for recording these plants. The catalog contains 14 illustrations and one in full color. Send 25 cents in coin to Ventura Epiphyllum Gardens, 201 McFarlane Dr., Ventura, Calif.

GATES FAMOUS CACTUS GARDENS

From these 10 acre gardens is issued a new illustrated wholesale list—free to dealers requesting same on their business letterhead. Corona, California.

Mr. Gates takes exception to the Editor's sarcastic statement in the September JOURNAL (p. 146) regarding cacti and succulents as chicken feed. In Corona, he finds that rabbits thrive on *Opuntia elata, O. monocantha* and *Echeveria multicaulis*. It is surprising how efficient the rabbits are in selecting these three species and always the finest plants.

NOTICE IOWA ENTHUSIASTS

Please communicate with Mrs. Henry A. Wurr, Rt. 1, Carroll, Iowa.

Society member J. P. Carabia, of the Colegio La Sale in Havana, came to the New York Botanical Garden the last of August on a Guggenheim fellowship for a year of preliminary work on the flora of Cuba. Mr. Carabia spent several months at the Garden in 1938.

PRESIDENT'S MESSAGE

The replies received thus far from our affiliates in answer to our questions in the last issue of the JOURNAL seem to favor the first week end in July (including the Fourth of July) for the general meeting to be held in St. Louis.

Many of our affiliates have not replied as yet but presumably they have not had a meeting since receiving our questionnaire and we hope to have their opinions soon.

We also await the nominations of the affiliates for Commercial membership and Fellowship in the Society. These types of membership require formal nomination by an affiliate before action can be taken by the board.

W. TAYLOR MARSHALL.

TAKE CARE OF YOUR CACTI AND SUCCULENTS

1. Use a container deep enough for your plant's roots, and wide enough for the diameter of the plants including spines.

2. Be sure of your drainage. A little lime rubble, and small pieces of charcoal are good to use, if not use pebbles one inch deep in all containers over three inches.

3. Pot your plants in a soil mixture containing one-third coarse sand and two-thirds good garden loam, if you cannot get non-acid leaf mold. A pinch or two of air-slaked lime and powdered charcoal are good soil conditioners. In general, succulents require heavier soil than cacti.

4. Do not use fertilizers until you have had some experience with your plants.

5. If the room is uniformly hot, water more often than if it is cooler. Once a week is usually enough, unless you use clay pots, which require more in a heated room. In a cool room considerably less. Spray occasionally with lukewarm water. The plants get dusty. Do not allow water to stand in a container. Water in the morning.

6. Give as much light as possible, unless otherwise directed. East, south or west windows. If next the glass, turn the plant about once a day at noon. Plants do well on a table with a lace curtain between them and the sun.

7. Do not expect your plants to bloom at once. Some bloom quickly, some more slowly, and some not at all in cultivation.

8. Two good books of a simple nature are important for the real collector. They are "Cacti for the Amateur" and "Succulents for the Amateur."

9. Don't worry if you don't get all this done. But if these directions are followed the plants will repay with dividends. Good luck to you.

ELINOR T. SUTTON, Jefferson, Iowa.

SPECIAL INTRODUCTORY OFFER

For a limited time we will ship, postpaid, on receipt of $1.50, the following 12, all different cacti, plus, your choice of an Old Man or an Old Lady, FREE. Golden Barrel, Golf Ball, Deer Antler, Cob, Pincushion, Peruvian Apple, Strawberry, Peyote Button, Peanut, Living Rock, Joseph's Coat, and a Scarlet Bugler.

Prompt Shipment, safe delivery and your complete satisfaction guaranteed.

WESTEX CACTUS GARDENS
Box 624, Cisco, Texas

The following 8 pages are the 8th Installment of the Monograph "Colorado Cacti" by Dr. C. H. Boissevain and Miss Carol Davidson.

Culture of Succulents in the Midwest

By LADISLAUS CUTAK, In charge of succulents, Missouri Botanical Garden
From *Missouri Botanical Garden Bulletin*

Although there is an increasing interest in succulents throughout the Middle West, no satisfactory work on their culture in this region has been published, and this article has been compiled from the writer's notes and observations in the hope that it will aid those attempting to grow these interesting plants. In its early days the Garden possessed the finest and most important collection of succulents in this country. Now two plant houses are devoted to their display, and thousands of visitors find great interest in the diversity and grotesqueness of their forms.

Before going any further, it might be well to explain the term "succulents." It is generally applied to those plants possessing fleshy or thickened leaves and stalks, and that are structurally adapted to live for prolonged periods without water. Under this group several thousand plants are listed belonging to various plant families, chiefly the Cactaceae, Crassulaceae, Euphorbiaceae, Amaryllidaceae, Liliaceae, Aizoaceae, and Portulacaceae. The cacti (Cactaceae) were originally confined to the New World, but have become naturalized in other countries, in many instances crowding out the indigeous plants. The spurges (Euphorbiaceae) are worldwide, but the succulent varieties are mostly native to South Africa, Madagascar, and the East Indies. The orpines (Crassulaceae), to which the sedums belong, are likewise distributed throughout the world, in both temperate and tropical climates. The century plants (Amaryllidaceae) are na-

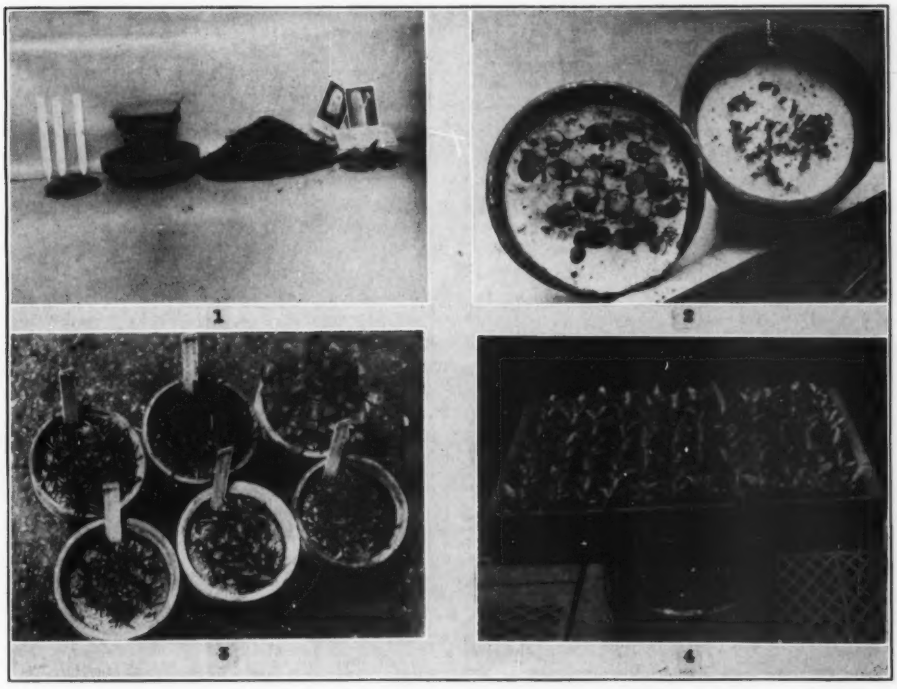


PLATE 19. GROWING SUCCULENTS FROM SEED

1. Materials needed; 2. Seedlings appearing; 3. Seedlings ready for transplanting; 4. Kalanchoe seedlings ready for potting.

tives of America, but the aloes (Liliaceae), which they somewhat resemble, are of African origin.

Cacti were among the first succulents to be cultivated. Soon after the discovery of America specimens of these picturesque plants were brought back to Europe by the early expeditions, and their popularity spread throughout continental Europe. Cactus fanciers vied with each other in securing the rarest plants, sparing no expense, and it is said that a certain horticultural enthusiast paid as much as 1000 francs for one of the smaller cacti. In America interest in desert plants seems to wax and wane, the present rage having begun in 1929. That their popularity is great and will persist for some time is evidenced by the numerous succulent societies which have recently been formed and the number of publications on the subject.

GROWING SUCCULENTS FROM SEED

One of the most fascinating phases of the culture of plants is growing them from seed, and this is especially true of succulents. Of course, great patience is required for this work, but the plants raised from seed are much healthier and better-appearing than the mature plants taken from the desert which are forced to adapt themselves to unnatural surroundings. Then, too, the wanton despoilation of our deserts by the self-styled "collectors," has made it necessary to adopt measures restricting collecting of the desert flora. Quarantine and other Federal restrictions also make it difficult to secure certain plants from their native homes. Apparently there is no alternative but to grow the succulents from seed.

Even the average flat dweller can grow a good number of seedlings in his home. All the equipment needed is a flower container, a piece of glass for cover, a saucer underneath to hold water, some good drainable soil, and a package of fresh seed (pl. 19, fig. 1). Seeds of various succulents are now readily obtainable from dealers in this country and abroad, at very moderate prices. Fresh, thoroughly matured seed is of the utmost importance for good and quick germination, and only reliable seed firms should be patronized. If a large quantity of seed is available, it may be planted at different times. The writer has found that the spring months are best for seed planting, although any month of the year will bring fairly good results provided a temperature of 70° F. and above is maintained. In the Midwest seedlings will be more apt to "damp-off" in the winter than in spring and summer. As a container a seed pan is generally used, but for small plantings the ordinary porous four-inch pot is preferable. Care should be taken that it be clean, as a dirty pot might contaminate the young seedlings. Necessary drainage can be provided by a generous use of broken pottery or coarse gravel in the bottom of the container. On top of this sift porous soil made up of equal parts of garden loam, well-decomposed leaf mold, and sand, to within an inch of the rim, and press the soil down lightly.

Since the seed of most succulents is very small, care should be taken that the soil cover be no deeper than the size of the seed itself. The tiny seeds may be scattered lightly over the soil, but the larger ones should be sown evenly in rows. (Seeds of the prickly pears, Opuntias, which are quite large and have a hard outer coat, should be rubbed between two pieces of sandpaper to facilitate quicker germination.) Next, fill saucer with water and place the seed pan in it. As soon as the surface of the soil shows moisture, empty the water from the saucer, press the soil down again (though very lightly), and scatter a thin layer of fine gravel on top. This last is important, as it helps in retaining moisture and likewise in supporting the tiny seedlings. Finally, place glass cover over the top, and set the pot in a well-lighted window. At this stage and even after germination never permit the seed pan to dry out, and ventilate occasionally be removing glass cover. Some varieties will develop rapidly while others may take a long time. However, if after three months no seedlings have made their appearance, it is advisable to dump the pot and try again. Generally tiny little seedlings begin to push their way up through the gravel in seven to fourteen days (pl. 19, fig. 2). At the Garden, the writer has tested many seeds of various succulents, over a period of years, and the average time of germination is listed below.

AMARYLLIDACEAE	Days
Agave brachystachys	18
chiapensis	27
chloracantha	42
densiflora	10
elongata	18
Ghiesbrechtii	22
Henriquesii	18
horrida	8
schidigera	12
Victoriae-Reginae	20

ASCLEPIADACEAE	Days
Duvalia Corderoyi	11
elegans	10
Piaranthus comptus	14
Stapelia conformis	7
Desmetiana	6
flavirostris	11
hirsuta	10
pulchella	10
verrucosa	10
Trichocaulon meloforme	7

CACTACEAE	
Cactus intortus	40
Cephalocereus Palmeri	18
senilis	20
Dendrocereus nudiflorus	33
Echinocereus Reichenbachii	50
Echinopsis valida	14
Hamatocactus setispinus	27
Harrisia Martinii	14
Myrtillocactus geometrizans	40
Neobesseya missouriensis	15
Neomammillaria elongata	22

CACTACEAE (Continued)
Opuntia imbricata 22
Oreocereus celsianus 38
Selenicereus urbanianus 18
Trichocereus macrogonus 21
Spachianus 14
CRASSULACEAE
Crassula argyrophylla 48
columnaris 11
rosularis 18
Cotyledon orbiculata 17
Echeveria edulis 11
Greenovia aurea 10
Kalanchoe Blossfeldiana 22
carnea 13
Dyeri 17
flammea 11
rotundifolia 15
thyrsiflora 14
velutina 22
pendulinus 27
EUPHORBIACEAE
Euphorbia abyssinica 11
antiquorum 7
Barnhartii 15
biglandulosa 18
Bivonae 8
caducifolia 15
conspicua 11
dendroides 6
ingens 23
mauretanica 31
Nivulia 7
Rothiana 23
LILIACEAE
Aloe africana 15
arborescens 39
aristata 39
Bortiana 11
ALOE (Continued)
caesia 11
greatheadii 12
latifolia 39
striata 11
supralaevis 15
Aprica congesta 14
foliolosa 11
Gasteria nitida 31
trigona 20
subverrucosa 20
Haworthia arachnoidea 14
asperula 31
attenuata 14
Bolusii 20
Cooperi 14
cymbiformis 14
fasciata 14
pilifera 31
Radula 10
translucens 27
tortuosa 27
Yucca baccata 11
Baileyi 9
elata 41
AIZOACEAE (Mesembryanthema)
Acrodon bellidiflorus 10
Aethephyllum pinnatifidum ... 10
Argyroderma Schlechteri 8
testiculare 7
Aridaria resurgens 14
splendens 5
velutina 8
Bergeranthus multiceps 10
scapiger 10
Braunsia edentula 10
Carpobrotus aequilaterus 10
Chasmatophyllum musculinum. 10
Cheiridopsis cigarettifera 9
AIZOACEAE (Continued)
Conophytum bilobum 9
Corpuscularia Taylorii 8
Cylindrophyllum calamiforme.. 8
Dactylopsis digitata 33
Delosperma Brunnthaleri 11
Disphyma crassulina 9
Dorotheanthus gramineus 11
Drosanthemum brevifolium ... 7
Erepsia heteropetala 14
inclaudens 17
Faucaria felina 17
lupina 17
Fenestraria rhopalophylla 10
Gibbaeum pubescens 10
Glottiphyllum linguiforme 11
Salmii 11
Hymenocyclus croceus 9
Juttadinteria Simpsonii 9
Leipoldtia Britteniana 10
Lithops Lesliei 9
Mentocalyx velutina 8
Mesembryanthemum amoenum. 9
aurantiacum 30
Brownii 9
coccineum 19
Haworthiai 32
Monilaria moniliformis 8
Nelia Meyeri 22
Oscularia caulescens 68
deltoides 33
Pleiospilos Bolusii 45
Psammophora longifolia 15
Rimaria Heathii 9
concavum 18
Sceletium anatomicum 10
Semmanthe lacera 27
Titanopsis calcarea 9
Trichocyclus ciliatus 15
Trichodiadema stelligerum 9

After seeds have germinated the glass cover should be removed and replaced by a piece of white tissue paper to shield the plantlets from the direct rays of the sun. Under ordinary house conditions, watering will be required every fourth to seventh day. As the tiny seedlings develop, give more light gradually. It will not be necessary to transplant for a long time, unless the seedlings become crowded and danger of damping-off is imminent (pl. 19, fig. 3). In transplanting the same mixture of soil can be used as for the seeds. Transplant into flats, larger seed pans, or individual 1½-inch pots, gradually shifting into larger containers as the plants require and always allowing plenty of room (pl. 19, fig. 4). It is not necessary to repot cactus very often; usually if kept in small pots the danger of overwatering will be avoided.

OTHER METHODS OF PROPAGATION

In addition to propagation by seed, most of the succulents can be multiplied vegetatively, i. e., by cuttings, by division of large clumps, by offsets, by leaves, or by grafting. By this method plants will attain maturity in a shorter time than when grown from seed. Almost any portion of the stem can generally be cut off, treated, and forced to produce new growth. All cuttings with a large cut surface, such as cacti and spurges, must be placed in a dry atmosphere for a few days in order to form a callus over the wounded section. This is important, for unless the cuticle is healed the cut surface would be subject to bacterial rot, which would quickly destroy the cutting. Succulents with small exposed surfaces, such as the hen-and-chicken plants (Echeveria), form a protective tissue in a few hours. Although most cuttings can be placed directly in a mixture of sand and soil, pure sand seems to be a better rooting medium. Some plants will produce a vigorous root system in a week. New shoots along the stem are a good indication that the cutting is forming roots. Water should be applied very sparingly or not at all until some sign of growth appears. Cuttings of tender succulents, such as the mesembryanthemums, must be shielded from the direct rays of the sun and their exposed parts lightly sprinkled to keep them from wilting.

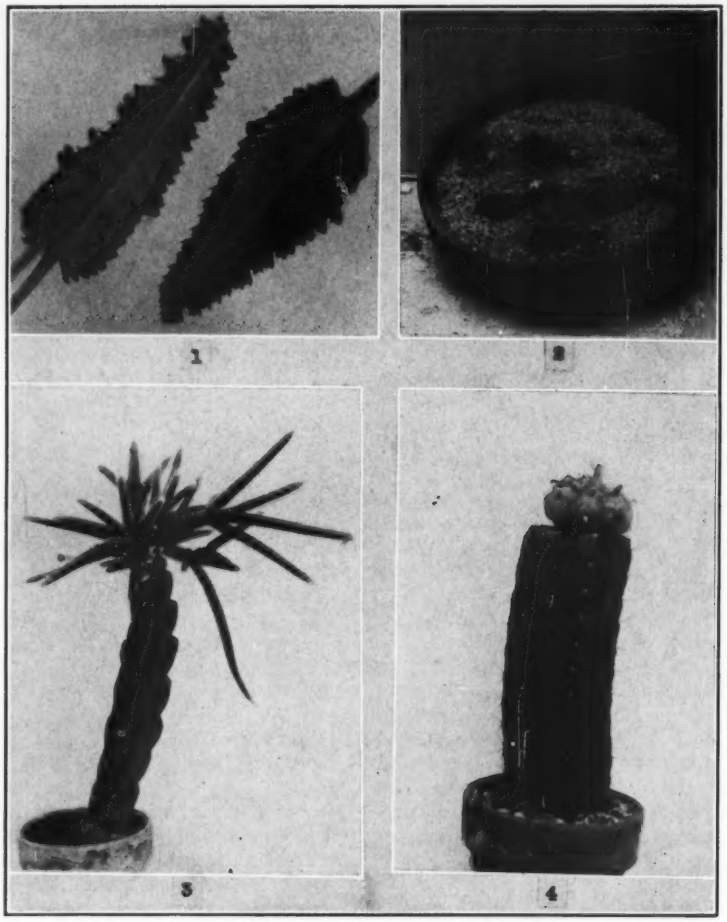


PLATE 20. PROPAGATION OF SUCCULENTS

1. Bryophyllum plantlets produced on the margins of leaves; 2. Leaves of Echeveria producing young plants; 3. *Aporocactus flagelliformis* cleft-grafted on *Hylocereus undatus;* 4. Flat graft of *Lophophora Williamsii* on *Cereus peruvianus.* Miniature desert gardens.

Many plants, as, for instance, the Opuntias (prickly pears), the Kalanchoës, and Bryophyllums, are naturally adapted to vegetative propagation. The stems and fruits of most prickly pears break off very easily and fall to the ground, where in a short time they throw out roots and develop independently as new plants. So strong is the principle of life in many succulent plants that they very often produce numerous tiny plantlets all along their stems or on the margins of the leaves. A good example of the former is Echinopsis, South American plants of the cactus family, with long trumpet-like flowers which open toward evening. Some of them, as *E. Eyriesii,* produce numerous offsets, either at the bottom or top of the old plant, which readily become detached from the mother plant and strike root in the surrounding soil. The writer has one such specimen completely covered with these tiny plants. The Bryophyllums are a good example of leaf propagation. Their name, meaning "life plants," was given on acount of the numerous plantlets which are produced along the margins of the leaves (pl. 20, fig. 1). These also detach themselves easily, cluttering the soil around the mother plant and growing independently. Most of the crassulaceous plants, such as the Sedums, Echeverias, Crassulas, Kalanchoës, and Bryophyllums, can be readily propagated by leaf cuttings. Simply take off a leaf,

place it in sand or on top of the soil, keep somewhat moist, and the baby plants will appear (pl. 20, fig. 2). Later these can be potted as seedlings.

GRAFTING

Grafting of succulents, especially cacti, is a very simple and interesting process resorted to for a variety of purposes, chiefly the following: To preserve certain species that through decay might be lost; to raise certain species that are very difficult to grow on their own root; to produce quicker growth; to insure a greater number of flowers; to develop bushy and more decorative plants or unusual novelties. Grafting is really nothing more than the union of two separate plants growing as one. The two plants used in grafting are known as the stock and the scion. The stock is the plant with the roots which supplies the nourishment to the scion, and the scion is the plant that is inserted on the stock. Almost any of the large-growing species of Cereus can be utilized as stock for the smaller-growing Opuntias, the delicate-spined pincushion cacti (Mammillaria), and the pendulous, epiphytic Rhipsalis. It is generally advisable to have stock at least six to twelve inches high, otherwise a stake will be needed for support. Grafting should be done in the hot season and care should be taken that the two plants to be used in the operation are in a healthy condition. There are two chief kinds of grafts, the cleft and the flat. Cleft graft is desirable for all thin-stemmed plants, such as the Christmas cactus, rhipsalis, and rat-tail cactus (pl. 20, fig 3). For the thick and globose types, as Echinocactus, Echinopsis, and Mammillaria, the flat graft is used (pl. 20, fig. 4). Directions for cleft grafting are simple. A sharp clean knife should be used (some prefer razor blades). After selecting the two plants, as, for instance, the night-blooming cereus (Selenicereus) for stock and the Christmas cactus (*Zygocactus truncatus*) for scion, cut stock to a desired height, and make a slit at the top about an inch long. Then cut the stem of the scion on each side to form a wedge and insert into the slit of the stock. Place in a warm, somewhat moist location, and be careful not to get any water on the cut surface. A two- to three-jointed Christmas cactus grafted on a night-blooming cereus grows amazingly fast and in two years should produce a wonderful head. When using the flat graft, the scion and stock should be of about the same diameter. Both plants should be cut with smooth transverse cuts and the two flat surfaces pressed firmly together and held in place by raffia or woolen threads, as shown in the accompanying diagrams.

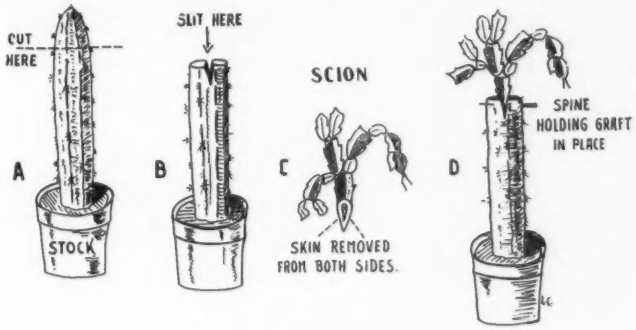


Fig. 1. Illustrating the cleft graft.

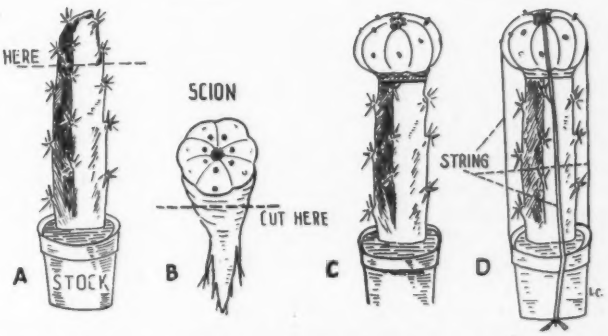


Fig. 2. Illustrating the flat graft.

SEASONAL CARE

To say that succulents, especially the cacti, need no attention, is a fallacy. Even among cactus plants different cultural methods must be applied. The greater majority are found growing under the hottest sun and in the poorest soil where the rainfall is very scanty; and yet even under such conditions the plants prosper and flower freely, for they have developed the ability to take up and store within their bodies the moisture which at intervals comes their way. The barrel cacti, the fish-hooks, the pincushions, the hedgehogs, and wicked chollas are but a few belonging to this class. They are generally very spiny, the spiny armament acting as a shield from the scorching rays of the sun. Plants of this type are very desirable for home culture because most of them are able to withstand the hot, dry atmosphere of our living rooms. The Christmas cactus, the broadleafs, rhipsalis, the rat-tails, and the trailing night-blooming cerei, are mostly epiphytic, growing with the orchids and bromeliads upon the trunks and branches of trees in tropical America. They require a richer soil (but very porous) and humid surroundings, and can be grown successfully in any ordinary sun-room.

Cacti from the hot deserts, as the barrel cacti, must be watered very moderately during the winter months, only at 3- to 4-week intervals and then only on clear, sunny days. The best way to water plants in the winter is to place them in a large vessel and allow the water to come up from below, moistening the roots only. The Christmas cactus and similar varieties must never be allowed to get very dry, although a short rest period in September to October and again after flowering is recommended. Other succulents, such as the Mesembryanthemums, need more water than a cactus. However, it must be remembered that good drainage is necessary at all times, as very few succulents will survive if their "feet" are constantly wet.

All succulents should be given a period of rest for three or four months during the winter, when they should be placed in a cooler room and watered more sparingly. If kept growing all the year around, no buds or very few will appear. Winter months as a rule are the danger months for succulent plants, but if proper attention is given to temperature, water, etc., no difficulty should be experienced. All plants that have been planted outdoors during the summer months must be brought indoors about the first of October. Many cactus plants that are whipped by bitter winds and covered under a blanket of snow in the mountainous regions of the Southwest cannot endure the winters of the Middle West. It isn't the cold that plays havoc, but the excessive dampness combined with cold. A few years ago many department stores in the Midwest were advertising the "Flame Ball" (Ferocactus) as a hardy species for our rock gardens, but every plant that was left outdoors died. Sunlight is an important factor in the life of a plant, and in order to obtain all that is possible in the winter the plants should be placed in window recesses or near windows. Without light plants will grow stringy, weak, and sickly, and often this condition will lead to their death.

On clear warm days, during the month of March, all succulents should be taken outdoors but must be brought in before evening. During April they can be left on the porch, but careful watch must be kept for frosts. By keeping the plants outside for part of the time, they are prepared to withstand the intense sunlight and warmth later. Usually, during May, plants can be set out permanently, either in rockeries, beds, or in borders. Because of the heavy spring rains in our Middle West, cacti and other succulents should be planted on a slope so that excess water will readily drain off. The writer does not recommend planting cacti directly in the ground, but rather plunging them with their pots to within an inch of the rim and covering the surface with gravel, limestone chats, or other small rocks. Although plants will do better if planted directly in the soil, the average worker will not have the time to dig them up carefuly and repot them in the fall. It should be remembered that succulents, in order to ripen their stems, need all the sun possible during the fall months and they should be left outdoors until there is danger of frost. A light frost will not bother the hardier types, and they usually may continue outside until about the end of October in the St. Louis area. October 1 should be used as the deadline for the tender kinds, but if a warm spell occurs at that time (as it often does) the plants may be left out for another week or two but a careful watch of the weather must be kept. Succulents exposed to the sunshine, the air, and rain during the summer months will do far better than those kept indoors and given home treatment.

GLASS-ENCLOSED DESERTS

A few years ago, glass gardens or Wardian cases were the rage, and many artistic woodland and jungle gardens were created in various types of glass containers. The woods and country side were scoured for tiny plantlets, while florists and nurserymen were besieged for the highly colored tropical plants to be used in the miniature jungle gardens. Somehow the use of succulent plants was generally overlooked, but the writer has found that cacti and other fleshy-leaved plants lend themselves admirably to this mode of cul-

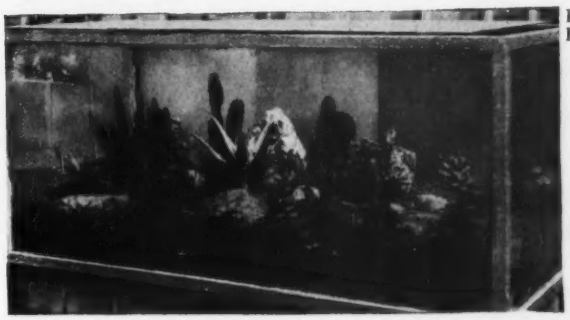


PLATE 20
Fig. 2

PLATE 20
Fig. 3

ture. It is surprising what a fine collection of tiny desert plants can be grown in just such a manner.

There is a great variety of glass containers from which to choose, but the most satisfactory are the 1-2-gallon drum-shaped aquaria and the 5-gallon (or more) rectangular aquaria. Select only those with clear glass free from flaws, since poor glass will produce distorted images of the plants within. For drainage, which is very important for succulent plants, gravel or sand must be supplied to the thickness of one inch at the bottom of the container. A few pieces of charcoal are then added, and finally two to three inches of porous soil. Care should be exercised to use only small plants, from two to three inches high, and never to crowd them as in woodland or jungle miniatures. After planting, the surface of the soil should be covered with sand or fine gravel and moistened lightly. Once a desert garden is planted and placed in a well-lighted position, no care will be necessary for a long time. Leave an inch of space between the glass cover and the opening, so that air will have free access at all times. An occasional "sweat" produced by closing the opening will prove beneficial, but if the soil seems to be saturated leave lid off until it dries out. The soil will seldom dry out completely, but if it does, water by hand. Experiments conducted by the writer at the Garden, over a period of years, show that the cacti are more suitable for growing in glass enclosures than the tender fleshy-leaved succulents. Glass gardens planted three years ago with cacti alone are still thriving, whereas the plants had to be replaced in those planted with Mesembryanthemums, Crassulas, Aloes, etc.

An experience I've had with my seedlings may be of interest and assistance to other cacti enthusiasts. When I transplant my seedlings I take them from the soil and put them in a dish with water and allow them to soak for a half hour or so. Then, when they are planted in fresh, slightly dampened soil, they commence to grow at once without the loss of a single tiny plant. MRS. P. L. APINS, Chicago.

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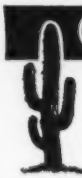

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